The Importance of Being Predictable

John B. Taylor

It is a pleasure to participate in this conference and join in the recognition of Bill Poole. My remarks build on two of Bill Poole's important contributions to monetary theory: his 1970 *Quarterly Journal of Economics* (*QJE*) paper on monetary policy under uncertainty and his more recent series of lucid short papers on predictability, transparency, and policy rules, many of which were adapted from speeches and published in the *Review* of the Federal Reserve Bank of St. Louis.

At the same time I want to express my appreciation for Bill's extraordinary service in public policy: starting in the 1960s as a member of the staff of the Federal Reserve Board, where he wrote his 1970 *QJE* paper and many others; then later as a member of the President's Council of Economic Advisers during the difficult disinflation of the early 1980s, where his role in explaining and supporting the Fed's price stability efforts was essential; and most recently as president of the Federal Reserve Bank of St. Louis, where his emphasis on good communication and good policy has contributed, and will continue to contribute, to improvements in the conduct of monetary policy. Regarding these contributions I give two of my favorite examples of Bill Poole's many pithy phrases which I hope will ring in monetary policymakers' ears for many years to come: "We ignore the behavior of the monetary aggregates at our peril" (Poole, 1999); and "Clearly, more talk does not necessarily mean more transparency" (Poole, 2005a).

THE BEGINNINGS OF RESEARCH ON POLICY RULES IN STOCHASTIC MODELS CIRCA 1970

Let me begin by reviewing Bill Poole's deservedly famous 1970 *QJE* article. In my view, that paper conveyed two novel messages, one about *dealing with* uncertainty and the other about *reducing* uncertainty.

An Approach to Monetary Policy That Could Deal with Existing Uncertainty

The first message was presented in the form of a simple graphical ISLM analysis, and soon after textbook writers incorporated this analysis in their macroeconomics and money and banking textbooks. At the time Poole wrote his paper, the typical IS and LM curves were drawn without a notion that they could move around stochastically. Bill Poole showed how adding exogenous disturbances to the curves provided a simple framework for monetary policy decisionmaking under uncertainty.

While the framework was simple, the message was extremely useful: When shocks to money demand are very large, central banks should target the interest rate because those shocks would otherwise cause harmful swings in interest rates. When

John B. Taylor is a professor of economics at Stanford University.

Federal Reserve Bank of St. Louis *Review*, July/August 2008, *90*(4), pp. 405-10.

shocks to investment demand or consumption demand are very large, central banks should target the money supply because the interest rate will move to mitigate these demand shocks. Hence, the Poole analysis showed explicitly how policymakers could deal with exogenous uncertainty in a formal mathematical way.

An Approach to Monetary Policy That Could Reduce Uncertainty

The second message was more complex and profound, and also more relevant for my purpose here. Poole investigated what he called a "combination policy" involving both the interest rate and the money supply, and he examined its properties in an economy-wide dynamic stochastic model. The model, with the combination policy inserted, could be written as a vector autoregression. Poole showed how to compute the steady-state stochastic distribution implied by the model. He also showed how to find the optimal policy to minimize the variance of real gross domestic product (GDP) around the mean of this stochastic steady-state distribution. The method involved finding the homogeneous and particular parts of the solution and then writing the endogenous variable as an infinite weighted sum of lagged shocks—what is now commonly called an impulse response function.

The combination policy had key features of active monetary policy rules in use today. The policy involved the money supply (M), the interest rate (r), and lagged values of real GDP (Y). Poole wrote it algebraically as

$$M = c_1' + c_2' r + \text{lagged values of } Y,$$

where the coefficients c_1' and c_2' were determined to minimize the variance of real GDP in the steady-state stochastic distribution. He showed that the optimal policy yielded a smaller loss than the fixed interest rate policy, the fixed money supply policy, or a combination policy that ignored the reactions to lagged real GDP.

Note that, although the rule was active, there was no discretion here. Once those parameters were chosen, they would stay for all time. People criticized Poole for this rule approach and argued instead in favor of discretion. They said that policymakers could see or forecast the shocks to the LM curve and the IS curve and adjust the policy instruments as they saw fit without having to stick to any one policy rule. For example, I have a vivid memory of discussing the Poole paper with Franco Modigliani after I presented a paper at MIT later in the decade. He insisted that there was no reason to constrain policymakers the way Poole did. There was still an enormous resistance to policy rules, even the active sort, at this time.

However, although discretionary actions might improve performance in a given situation, the possibility of discretion, and especially its misuse, could add to the uncertainty already in the markets. The advantage of Poole's active policy rules was that they were more predictable and could therefore reduce uncertainty. The second lesson from Poole's 1970 paper was thus that policymaking based on rules would improve economic performance by reducing uncertainty compared with policymaking based on pure discretion.

This same basic stochastic dynamic modeling approach was applied again and again in the 1970s and 1980s, eventually to more complex empirically estimated models with rational expectations and sticky prices. Optimal rules were computed in these newer models. Over time the resistance to active policy rules began to weaken. Most surprising was that actual monetary policy decisions became more predictable and could even be described closely by policy rules. Most rewarding was that the more predictable rule-like behavior yielded improved policy performance. And most interesting is that we can now look back at this period of greater predictability and learn from it.

RULES OF THUMB IN THE PRIVATE SECTOR

An unanticipated advantage—at least from the vantage point of 1970—of the more predictable behavior by central banks has been the response of the private sector. Recognizing that the central bank's interest rate settings are following more regular rule-like responses to such variables as

inflation and real GDP, the private sector has taken these responses into account in projecting future variables and in developing their own rules of thumb for making decisions. An important example is the formation of expectations of future interest rates, which affect bond traders' and investors' decisions and thereby influence long-term interest rates, as has been emphasized by Poole in his more recent writings. I quote from a paper he gave earlier this year (Poole, 2007, p. 6):

> What our analysis missed a generation ago was that the typical model with only one interest rate could not possibly allow for stabilizing market responses in long rates when the central bank set the short rate. Of course, macro econometric models did have both short and long rates, but the structure of the models did not permit analysis of the sort I am discussing because the typical term structure equation made the long rate a distributed lag on the short rate. The model's short rate, in turn, was determined by monetary policymakers setting it directly or by the money market under a policy determining money growth.
>
> Once we allow expectations to uncouple the current long rate from the current short rate, the situation changes dramatically. The market can respond to incoming information in a stabilizing way without the central bank having to respond. Long bond rates can change, and change substantially, while the federal funds rate target remains constant.

In this example, the private sector has adapted to a particular policy rule in which the short-term interest rate rises by a predictable amount when inflation rises. Thus, if expectations of inflation rise, the private sector will predict that the central bank will raise short-term interest rates in the future; traders will then bid down bond prices, raising long-term interest rates, and thereby mitigating the inflationary impulse before the central bank action is needed.

There are other examples where private sector behavior has adapted to rule-like behavior of the central bank. Consider foreign exchange markets. Empirical studies show that when there is a surprise increase in inflation, the immediate reaction in foreign exchange markets is an appreciation of the currency. Yet conventional price theory would predict the opposite, a negative correlation between exchange rates and inflation, because higher prices make goods at home relatively expensive, requiring a depreciation of the currency to keep purchasing power from moving too far away from parity. But the regular central bank interest rate response to inflation explains the empirical correlation. How? An increase in inflation implies that the central bank will raise the interest rate, which makes the currency more attractive, bidding up the exchange rate.

There are many other examples where individuals and institutions in the private sector adapt to policy-induced correlations. In effect, they are creating their own rule-like behavior, their own rules of thumb, and we are probably unaware of most of them. Indeed, the individuals who act on them may not even know that they derive from the rule-like behavior of policymakers. Of course, it is not only the private sector in the United States. Markets all over the world follow closely what the Fed is likely to do.

And it is not only the private sector. Central banks take account of the predictable behavior of the other central banks and in particular the behavior of the Federal Reserve, which matters greatly for their own decisions. For example, the recent June 2007 Monetary Policy Report of the Norges Bank states that "It cannot be ruled out that a wider interest rate differential will lead to an appreciation of the krone. This may suggest a gradualist approach in interest rate setting." In other words, actions by the Federal Reserve that affect the interest rate differential will in turn influence interest rates set by other central banks. This effect can also occur automatically—another rule of thumb—if model simulations used to set interest rates at central banks assume, as they usually do, that other central banks follow such policy rules.

An implication of this development is that if central banks depart from their regular responses, then they run the risk of disrupting private sector rules of thumb. Even if they explain the reason for the irregular behavior as clearly as possible, emphasizing that it is temporary, some individuals or institutions may continue operating with the old rules of thumb unaware that these rules have

anything to do with the monetary policy–induced correlations.

For example, during the period from 2002 to 2005, the interest rate in the United States fell well below levels that would have been predicted from the behavior of the Federal Reserve during most of the period during the Great Moderation. Using modern time-series methods, Frank Smets and Marek Jaronciński (2008) showed in their paper for this conference that there was such a deviation, and they linked the deviation to the boom and bust in housing prices and construction. In Taylor (2007), I argued that the resulting acceleration of housing starts and housing prices, as well as the low interest rates, may have upset rules of thumb that mortgage originators were using to assess the payment probabilities based on various characteristics of the borrower. Their programs are usually calibrated in a cross section at a point in time. If housing prices start rising rapidly, the cross section will show increased payment probabilities, but the programs will miss this time-series element. When housing prices reverse, the models will break down. It would have been very difficult to predict a breakdown in the rules of thumb such as the mortgage underwriting programs, but if it had not been that rule of thumb, it might have been another.

Another related example was the negligible response of long-term interest rates when the Federal Reserve raised short-term interest rates in 2004 and 2005. This might be explained by this same deviation. Investors may have felt that the Fed had departed from the kind of rule that formed the basis of the longer-term interest rate responses of the kind discussed in the above quote by Poole.

Two examples from international monetary policy issues are also worth noting. Following the Russian debt default and financial crisis of 1998 there was a global contagion that affected emerging markets with little connection to Russia. The contagion even reached the United States, led to the Long Term Capital Management crisis, and caused enough of a freeze-up in U.S. markets that the Federal Reserve reduced the interest rate by 75 basis points. In contrast, following a very similar default and financial crisis in Argentina in 2001, there was virtually no contagion. The main difference between these two episodes in my view is predictability. In the case of Russia, the International Monetary Fund suddenly removed financial support, only one month after renewing it. This surprise disrupted the world's financial markets. In contrast, in the case of Argentina, the International Monetary Fund gradually reduced support and was as clear as it possibly could be in its intentions. Hence, there was little surprise. The default and currency crises were discounted by the time they happened.

Another international example is the currency intervention policy of the United States and the other key currency countries. There has been no intervention by the United States or Europe in these markets since September 2000. And since March 2004, Japan has not intervened. Moreover, most policymakers in these countries have suggested a strong aversion to intervention in the currency markets. In effect, compared with a policy of frequent intervention, as in the 1980s and 1990s, the currency policy has become much more predictable. The assumption of zero intervention in most circumstances is a good one. What has been the result? The behavior of the major currencies has been less volatile and even the volatility of volatility has come down.

It is difficult to prove causality in any of these examples, and certainly more research is needed. Our experience with different degrees of predictability is increasing and strongly suggests advantages of policy predictability and risks of unpredictability.

Toward Greater Predictability

There have been great strides in improving monetary policy predictability at the Federal Reserve and other central banks in recent years, as Bill Poole has documented and explained (Poole, 2003 and 2005a,b; Poole and Rasche, 2003). Can we make monetary policy even more predictable?

One suggestion is to publish the Fed's balance sheet on a daily basis, or at least the Fed balances that commercial banks hold at the Fed. This would make it easier to interpret episodes where the central bank decides to provide additional liquidity in the overnight money market, as on August 9 and 10 of this year. The available data on repos

do not provide the information that analysts need to interpret these actions and to distinguish them from monetary policy actions aimed at overall macroeconomic goals of price stability and output stability.

Another suggestion would be to publish some of the key assumptions used in formulating policy, including potential GDP and/or the GDP gap, or at least publish these with a shorter lag. This would make it easier for the private sector to assess the deviations from policy rules. In this regard, it is interesting that Bill Poole's (2006) recent analysis of the Fed's policy rule could not go beyond 2001, because the data on the GDP gap were not released beyond that date.

What about the Federal Reserve formally announcing numerical inflation targets as other central banks have done? I have suggested moving slowly in this direction because a sudden change could be misunderstood, and because policy has worked well for two decades with a more informal inflation target. A further lengthening of the inflation forecast horizon for the Monetary Policy Report would be an example of a more gradual change and would be a good step in my view.

I have been concerned that placing more emphasis on a numerical inflation target could take emphasis away from predictability in setting the instruments. From the perspective of a policy rule approach, publishing one part of the rule—the inflation target—and not publishing other parts—the reaction coefficients—would create an asymmetry in a direction away from the regular reactions of the instruments that I have stressed in these remarks. Perhaps there is a way to prevent creating such an asymmetry. For example, the possibility of a joint announcement might be considered, perhaps both a target range for the inflation rate, from 1.5 to 2.5 percent, and a target range for the reaction coefficient of the interest rate to the inflation rate, from 1.5 to 2.5 percent, but there are many other possibilities.

CONCLUSION

In these remarks I have tried to convince you of the importance of being predictable in monetary policy, building on Bill Poole's paper written nearly four decades ago and on more recent experience with different degrees of predictability in practice. One of the key points, which needs much more research, is how the private sector and other public sector institutions develop rules of thumb that are based, perhaps unknowingly, on the systematic rule-like behavior of the monetary authorities. These private sector rules of thumb can improve the operation of the economy, but they can be broken in unanticipated and disruptive ways if policy becomes less predictable even for a short time and even if policymakers make their very best efforts to explain why.

REFERENCES

Jaroncinski, Marek and Smets, Frank R. "House Prices and the Stance of Policy." Federal Reserve Bank of St. Louis *Review*, July/August 2008, *90*(4), pp. 339-65.

Poole, William. "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model." *Quarterly Journal of Economics*, May 1970, *84*(2), pp. 197-216.

Poole, William. "Monetary Policy Rules?" Federal Reserve Bank of St. Louis *Review*, March/April 1999, *81*(2), pp. 3-12.

Poole, William. "Fed Transparency: How Not Whether?" Federal Reserve Bank of St. Louis *Review*, November/December 2003, *85*(6), pp. 1-8.

Poole, William. "FOMC Transparency." Federal Reserve Bank of St. Louis *Review*, January/February 2005a, *87*(1), pp. 1-9.

Poole, William. "How Predictable Is Fed Policy?" Federal Reserve Bank of St. Louis *Review*, November/December 2005b, *87*(6), pp. 659-68.

Poole, William. "The Fed's Monetary Policy Rule." Federal Reserve Bank of St. Louis *Review*, January/February 2006, *88*(1), pp. 1-12.

Poole, William. "Milton and Money Stock Control." Presented at the Milton Friedman luncheon, co-

sponsored by the University of Missouri–Columbia Department of Economics, the Economic and Policy Analysis Research Center, and the Show-Me Institute; Columbia, MO, July 31, 2007.

Poole, William and Rasche, Robert H. "The Impact of Changes in FOMC Disclosure Practices on the Transparency of Monetary Policy: Are Markets and the FOMC Better 'Synched'?" Federal Reserve Bank of St. Louis *Review*, January/February 2003, *85*(1), pp. 1-10.

Taylor, John B. "Housing and Monetary Policy." Panel discussion at the Federal Reserve Bank of Kansas City Symposium *Housing, Housing Finance, and Monetary Policy*, Jackson Hole, WY, September 1, 2007.

Monetary Policy Under Uncertainty

Ben S. Bernanke

Bill Poole's career in the Federal Reserve System spans two decades separated by a quarter of a century. From 1964 to 1974, Bill was an economist on the staff of the Board's Division of Research and Statistics. He then left to join the economics faculty at Brown University, where he stayed for nearly 25 years. Bill rejoined the Fed in 1998 as president of the Federal Reserve Bank of St. Louis, so he is now approaching the completion of his second decade in the System.

As it happens, each of Bill's two decades in the System was a time of considerable research and analysis on the issue of how economic uncertainty affects the making of monetary policy, a topic on which Bill has written and spoken many times. I would like to compare the state of knowledge on this topic during Bill's first decade in the System with what we have learned during his most recent decade of service. The exercise is interesting in its own right and has the added benefit of giving me the opportunity to highlight Bill's seminal contributions in this line of research.

DEVELOPMENTS DURING THE FIRST PERIOD: 1964-74

In 1964, when Bill began his first stint in the Federal Reserve System, policymakers and researchers were becoming increasingly confident in the ability of monetary and fiscal policy to smooth the business cycle. From the traditional Keynesian perspective, which was the dominant viewpoint of the time, monetary policy faced a long-term tradeoff between inflation and unemployment that it could exploit to keep unemployment low over an indefinitely long period at an acceptable cost in terms of inflation. Moreover, improvements in econometric modeling and the importation of optimal-control methods from engineering were seen as having the potential to tame the business cycle.

Of course, the prevailing optimism had its dissenters, notably Milton Friedman. Friedman believed that the inherent complexity of the economy, the long and variable lags with which monetary policy operates, and the political and bureaucratic influences on central bank decision-making precluded policy from fine-tuning the level of economic activity. Friedman advocated the use of simple prescriptions for monetary policy—such as the *k* percent money growth rule—which

Ben S. Bernanke is Chairman of the Board of Governors of the Federal Reserve System.

Federal Reserve Bank of St. Louis *Review*, July/August 2008, *90*(4), pp. 410-15.

he felt would work reasonably well on average while avoiding the pitfalls of attempting to fine-tune the economy in the face of pervasive uncertainty (Friedman, 1968).

Other economists were more optimistic than Friedman about the potential benefits of activist policies. Nevertheless, they recognized that the fundamental economic uncertainties faced by policymakers are a first-order problem and that improving the conduct of policy would require facing that problem head on. During this decade, those researchers as well as sympathetic policymakers focused especially on three areas of economic uncertainty: the current state of the economy, the structure of the economy (including the transmission mechanism of monetary policy), and the way in which private agents form expectations about future economic developments and policy actions.

Uncertainty about the current state of the economy is a chronic problem for policymakers. At best, official data represent incomplete snapshots of various aspects of the economy, and even then they may be released with a substantial lag and be revised later. Apart from issues of measurement, policymakers face enormous challenges in determining the sources of variation in the data. For example, a given change in output could be the result of a change in aggregate demand, in aggregate supply, or in some combination of the two.

As most of my listeners know, Bill Poole tackled these issues in a landmark 1970 paper, which examined how uncertainty about the state of the economy affects the choice of the operating instrument for monetary policy (Poole, 1970). In the simplest version of his model, Bill assumed that the central bank could choose to specify its monetary policy actions in terms of a particular level of a monetary aggregate or a particular value of a short-term nominal interest rate. If the central bank has only partial information about disturbances to money demand and to aggregate demand, Bill showed that the optimal choice of policy instrument depends on the relative variances of the two types of shocks. In particular, using the interest rate as the policy instrument is the better choice when aggregate demand is relatively stable but money demand is unstable, with money growth being the preferable policy instrument in the opposite case.

Bill was also a pioneer in formulating simple feedback rules that established a middle ground between the mechanical approach advocated by Friedman and the highly complex prescriptions of optimal-control methods. For example, Bill wrote a Federal Reserve staff paper titled "Rules-of-Thumb for Guiding Monetary Policy" (Poole, 1971). Because his econometric analysis of the available data indicated that money demand was more stable than aggregate demand, Bill formulated a simple rule that adjusted the money growth rate in response to the observed unemployment rate. Bill was also practical in noting the pitfalls of mechanical adherence to any particular policy rule; in this study, for example, he emphasized that the proposed rule was not intended "to be followed to the last decimal place or as one that is good for all time [but]…as a guide—or as a benchmark—against which current policy may be judged" (p. 152).

Uncertainty about the structure of the economy also received attention during that decade. For example, in his elegant 1967 paper, Bill Brainard showed that uncertainty about the effect of policy on the economy may imply that policy should respond more cautiously to shocks than would be the case if this uncertainty did not exist. Brainard's analysis has often been cited as providing a theoretical basis for the gradual adjustment of policy rates of most central banks. Alan Blinder has written that the Brainard result was "never far from my mind when I occupied the Vice Chairman's office at the Federal Reserve. In my view…a little stodginess at the central bank is entirely appropriate" (Blinder, 1998, p. 12).

A key source of uncertainty became evident in the late 1960s and 1970s as a result of highly contentious debates about the formation of expectations by households and firms. Friedman (1968) and Ned Phelps (1969) were the first to highlight the central importance of expectations formation, arguing that the private sector's expectations adjust in response to monetary policy and therefore preclude any long-run tradeoff between unemployment and inflation. However, Friedman

and Phelps retained the view that monetary policy could exert substantial effects on the real economy over the short to medium run. In contrast, Robert Lucas and others reached more dramatic conclusions, arguing that only unpredictable movements in monetary policy can affect the real economy and concluding that policy has no capacity to smooth the business cycle (Lucas, 1972; Sargent and Wallace, 1975). Although these studies highlighted the centrality of inflation expectations for the analysis of monetary policy, the profession did not succeed in reaching any consensus about how those expectations evolve, especially in an environment of ongoing structural change.

DEVELOPMENTS DURING THE SECOND PERIOD: 1998-2007

Research during the past 10 years has been very fruitful in expanding the profession's understanding of the implications of uncertainty for the design and conduct of monetary policy.

On the issue of uncertainty about the state of the economy, Bill's work continues to provide fundamental insights regarding the choice of policy instrument. Money-demand relationships were relatively stable through the 1950s and 1960s, but, in the wake of dramatic innovations in banking and financial markets, short-term money-demand relationships became less predictable, at least in the United States. As a result, consistent with the policy implication of Bill's 1970 model, the Federal Reserve (like most other central banks) today uses the overnight interbank rate as the principal operating target of monetary policy. Bill's research also raised the possibility of specifying the operating target in other ways, for example, as an index of monetary or financial conditions; and it provided a framework for evaluating the usefulness of intermediate targets—such as core inflation or the growth of broad money—that are only indirectly controlled by policy.

More generally, the task of assessing the current state of the economy remains a formidable challenge. Indeed, our appreciation of that challenge has been enhanced by recent research using real-time data sets.[1] For example, Athanasios Orphanides has shown that making such real-time assessments of the sustainable levels of economic activity and employment is considerably more difficult than estimating those levels retrospectively. His 2002 study of U.S. monetary policy in the 1970s shows how mismeasurement of the sustainable level of economic activity can lead to serious policy mistakes.

On a more positive note, economists have made substantial progress over the past decade in developing new econometric methods for summarizing the information about the current state of the economy contained in a wide array of economic and financial market indicators (Svensson and Woodford, 2003). Dynamic-factor models, for example, provide a systematic approach to extracting information from real-time data at very high frequencies. These approaches have the potential to usefully supplement more informal observation and human judgment (Stock and Watson, 2002; Bernanke and Boivin, 2003; and Giannone, Reichlin, and Small, 2005).

The past decade has also witnessed significant progress in analyzing the policy implications of uncertainty regarding the structure of the economy. New work addresses not only uncertainty about the values of specific parameters in a given model of the economy but also uncertainty about which of several competing models provides the best description of reality. Some research has attacked those problems using Bayesian optimal-control methods (Brock, Durlauf, and West, 2003). The approach requires the specification of an explicit objective function as well as of the investigator's prior probabilities over the set of plausible models and parameter values. The Bayesian approach provides a useful benchmark for policy in an environment of well-defined sources of uncertainty about the structure of the economy, and the resulting policy prescriptions give relatively greater weight to outcomes that have a higher probability of being realized. In contrast, other researchers, such as Lars Hansen and Thomas Sargent (2007), have developed robust-

[1] A recent example is Faust and Wright (2007).

control methods—adapted from the engineering literature—that are aimed at minimizing the consequences of worst-case scenarios, including those with only a low probability of being realized.

An important practical implication of all this recent literature is that Brainard's attenuation principle may not always hold. For example, when the degree of structural inertia in the inflation process is uncertain, the optimal Bayesian policy tends to involve a more pronounced response to shocks than would be the case in the absence of uncertainty (Söderstrom, 2002). The concern about worst-case scenarios emphasized by the robust-control approach may likewise lead to amplification rather than attenuation in the response of the optimal policy to shocks (Giannoni, 2002; Onatski and Stock, 2002; and Tetlow and von zur Muehlen, 2001). Indeed, intuition suggests that stronger action by the central bank may be warranted to prevent particularly costly outcomes.

Although Bayesian and robust-control methods provide insights into the nature of optimal policy, the corresponding policy recommendations can be complex and sensitive to the set of economic models being considered. A promising alternative approach—reminiscent of the work that Bill Poole did in the 1960s—focuses on simple policy rules, such as the one proposed by John Taylor, and compares the performance of alternative rules across a range of possible models and sets of parameter values (Levin, Wieland, and Williams, 1999 and 2003). That approach is motivated by the notion that the perfect should not be the enemy of the good; rather than trying to find policies that are optimal in the context of specific models, the central bank may be better served by adopting simple and predictable policies that produce reasonably good results in a variety of circumstances.

Given the centrality of inflation expectations for the design of monetary policy, a key development over the past decade has been the burgeoning literature on the formation of these expectations in the absence of full knowledge of the underlying structure of the economy.[2] For example, considerations of how the public learns about the economy and the objectives of the central bank can affect the form of the optimal monetary policy (Gaspar, Smets, and Vestin, 2006; and Orphanides and Williams, 2007). Furthermore, when the public is unsure about the central bank's objectives, even greater benefits may accompany achieving a stable inflation rate, as doing so may help anchor the public's inflation expectations. These studies also show why central bank communications is a key component of monetary policy; in a world of uncertainty, informing the public about the central bank's objectives, plans, and outlook can affect behavior and macroeconomic outcomes (Bernanke, 2004; and Orphanides and Williams, 2005).

CONCLUSION

Uncertainty—about the state of the economy, the economy's structure, and the inferences that the public will draw from policy actions or economic developments—is a pervasive feature of monetary policymaking. The contributions of Bill Poole have helped refine our understanding of how to conduct policy in an uncertain environment. Notably, we now appreciate that policy decisions under uncertainty must take into account a range of possible scenarios about the state or structure of the economy, and those policy decisions may look quite different from those that would be optimal under certainty. For example, policy actions may be attenuated or augmented relative to the "no-uncertainty benchmark," depending on one's judgments about the possible outcomes and the costs associated with those outcomes. The fact that the public is uncertain about and must learn about the economy and policy provides a reason for the central bank to strive for predictability and transparency, avoid overreacting to current economic information, and recognize the challenges of making real-time assessments of the sustainable level of real economic activity and employment. Most fundamentally, our discussions of the pervasive uncertainty that we face as policymakers is a powerful reminder of the need for humility about our ability to forecast and manage the future course of the economy.

[2] See Bernanke (2007) and the references therein.

REFERENCES

Bernanke, Ben S. "Fedspeak." Presented at the Meetings of the American Economic Association, San Diego, January 3, 2004; www.federalreserve.gov/boarddocs/speeches/2004/200401032/default.htm.

Bernanke, Ben S. "Inflation Expectations and Inflation Forecasting." Presented at the Monetary Economics Workshop of the National Bureau of Economic Research Summer Institute, Cambridge, MA, July 10, 2007; www.federalreserve.gov/newsevents/speech/bernanke20070710a.htm.

Bernanke, Ben S. and Boivin, Jean. "Monetary Policy in a Data-Rich Environment." *Journal of Monetary Economics*, April 2003, *0*(3), pp. 525-46.

Blinder, Alan S. *Central Banking in Theory and Practice*. Cambridge, MA: MIT Press, 1998.

Brainard, William C. "Uncertainty and the Effectiveness of Policy." *American Economic Review*, May 1967, *57*(2), pp. 411-25.

Brock, William A.; Durlauf, Steven N. and West, Kenneth D. "Policy Analysis in Uncertain Economic Environments." *Brookings Papers on Economic Activity*, 2003, *1*, pp. 235-322.

Faust, Jon and Wright, Jonathan H. "Comparing Greenbook and Reduced Form Forecasts Using a Large Realtime Dataset." Presented at the Federal Reserve Bank of Philadelphia conference *Real-Time Data Analysis and Methods in Economics*, April 19-20, 2007; www.phil.frb.org/econ/conf/rtconference2007/papers/Paper-Wright.pdf.

Friedman, Milton. "The Role of Monetary Policy." *American Economic Review*, March 1968, *58*(1), pp. 1-17.

Gaspar, Vitor; Smets, Frank and Vestin, David. "Adaptive Learning, Persistence, and Optimal Monetary Policy." *Journal of the European Economic Association*, April-May 2006, *4*(2/3), pp. 376-85.

Giannone, Domenico; Reichlin, Lucrezia and Small, David. "Nowcasting GDP and Inflation: The Real-Time Informational Content of Macroeconomic Data Releases." Finance and Economics Discussion Series 2005-42, Board of Governors of the Federal Reserve System, October 2005; www.federalreserve.gov/pubs/feds/2005.

Giannoni, Marc P. "Does Model Uncertainty Justify Caution? Robust Optimal Monetary Policy in a Forward-Looking Model." *Macroeconomic Dynamics*, February 2002, *6*(1), pp. 111-44.

Hansen, Lars Peter and Sargent, Thomas J. *Robustness*. Princeton, NJ: Princeton University Press, 2007.

Levin, Andrew; Wieland, Volker and Williams, John. "Robustness of Simple Monetary Policy Rules Under Model Uncertainty," in John B. Taylor, ed., *Monetary Policy Rules*. Chicago: University of Chicago Press, 1999, pp. 263-99.

Levin, Andrew; Wieland, Volker and Williams, John. "The Performance of Forecast-Based Monetary Policy Rules under Model Uncertainty." *American Economic Review*, June 2003, *93*(3), pp. 622-45.

Lucas, Robert E. Jr. "Expectations and the Neutrality of Money." *Journal of Economic Theory*, April 1972, *4*(2), pp. 103-24.

Onatski, Alexei and Stock, James H. "Robust Monetary Policy under Model Uncertainty in a Small Model of the U.S. Economy." *Macroeconomic Dynamics*, February 2002, *6*(1), pp. 85-110.

Orphanides, Athanasios. "Monetary-Policy Rules and the Great Inflation." *American Economic Review*, May 2002, *92*(2), pp. 115-20.

Orphanides, Athanasios and Williams, John C. "Inflation Scares and Forecast-Based Monetary Policy." *Review of Economic Dynamics*, April 2005, *8*(2), pp. 498-527.

Orphanides, Athanasios and Williams, John C. "Robust Monetary Policy with Imperfect Knowledge." *Journal of Monetary Economics*, July 2007, *54*(5), pp. 1406-35.

Phelps, Edmund S. "The New Microeconomics in Inflation and Employment Theory." *American Economic Review*, May 1969, *59*(2), pp. 147-60.

Poole, William. "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model." *Quarterly Journal of Economics*, May 1970, *84*(2), pp. 197-216.

Poole, William. "Rules-of-Thumb for Guiding Monetary Policy," in *Open Market Policies and Operating Procedures: Staff Studies*. Washington, DC: Board of Governors of the Federal Reserve System, 1971, pp. 135-89.

Sargent, Thomas J. and Wallace, Neil. "'Rational Expectations,' the Optimal Monetary Instrument, and the Optimal Money Supply Rule." *Journal of Political Economy*, April 1975, *83*(2), pp. 241-54.

Söderstrom, Ulf. "Monetary Policy with Uncertain Parameters." *Scandinavian Journal of Economics*, February 2002, *104*(1), pp. 125-45.

Stock, James H. and Watson, Mark W. "Forecasting Using Principal Components from a Large Number of Predictors." *Journal of the American Statistical Association*, December 2002, *97*(460), pp. 1167-79.

Svensson, Lars E.O. and Woodford, Michael. "Indicator Variables for Optimal Policy." *Journal of Monetary Economics*, April 2003, *50*(2), pp. 691-720.

Tetlow, Robert J. and von zur Muehlen, Peter. "Robust Monetary Policy with Misspecified Models: Does Model Uncertainty Always Call for Attenuated Policy?" *Journal of Economic Dynamics and Control*, June/July 2001, *25*(6/7), pp. 911-49.

The Importance of Being Predictable

William Poole

This has been an absolutely wonderful occasion for me. I deeply appreciate all those who have come: friends that I've known from way, way back, newer friends recently formed. And I am very gratified that Ben Bernanke and John Taylor joined on the panel. I especially want to thank, above all, Bob Rasche and the Research Division here, both for organizing and executing this event—but even more than that for the support that I've gotten and the intellectual excitement over my almost 10 years here. We've really worked together in a very collegial way. It's going to be hard to imagine being productive without having a staff like that behind me. They have been coauthors, really—staff is really the wrong way to put it—coauthors on the speeches, some of which have been published in the Federal Reserve Bank of St. Louis *Review*.

Well, nostalgia takes you only so far. And, so I want to talk about business, if you will, going back to some of the earlier literature. How we got to where we are today does help to inform us about some very important current issues. I was fascinated—totally unexpected—that my obscure, 1971 paper would become a centerpiece of some of the discussion. It's interesting to reflect on that because the times were so different. When I was working on that paper, the policy of the Federal Reserve was sort of unspecified. It was calculated meeting by meeting. And what struck me was that there are (at least the way I looked at it with my Chicago background) some powerful business

William Poole was the president of the Federal Reserve Bank of St. Louis at the time this conference was held.

Federal Reserve Bank of St. Louis *Review*, July/August 2008, *90*(4), pp. 415-19.

cycle regularities—just the very crude sort of thing that Friedman and Schwartz demonstrated, the patterns of money growth and interest rates over the business cycle. And so my idea was that we've got to find a way to avoid making exactly the same mistake over and over again. When you go back and look at the business cycles in the 1920s and 50s and 60s, it just looked like the same mistake over and over again. So there had to be some way of formalizing something as a—call it a rule of thumb—a baseline, and say we should depart from some baseline behavior only if we had some pretty good reason for doing so. Otherwise, we're just going to be making the same mistake over and over again. And, in fact, we did make the same mistake, in a business cycle sense, several times more after that. So that was the origin of that paper; it was nothing more complicated than that.

There was one other piece of it. In this era there was tremendous disagreement between those who viewed policy in the context of setting a monetary aggregate (the Chicago background that I had) and those who looked at policy entirely through an interest rate filter. And, of course, the origin of my 1970 paper was an attempt to make sense of those different views. You could not make sense of it in a deterministic model. It had to have something to do (if there was anything valid in this debate) with the uncertainty in the model, the nature of the disturbances. And that was the origin of my 1970 paper. And the origin of this sort of combination money growth/interest rate rule that was discussed earlier here at this conference was really an effort to try to bridge the gap between these two very different schools of thought and how they approached monetary policy. And obviously John Taylor did a much, much better job with that later on.

Now, in the discussion of the Svensson and Williams (2008) paper at this conference, which I had not seen before, there was something that sort of rubbed me the wrong way and I couldn't put my finger on it right away. I raised the issue about the model's assumption about central bank behavior, the assumption of the state of knowledge in the private sector. And the answer was the model assumes complete knowledge of the central bank. As I reflect on that, that's equivalent to saying that the central bank has permanent credibility—no one will ever doubt what the central bank is going to do. Put another way, that everyone knows exactly what the central bank is going to do. And I just don't believe that's a valid assumption. I think credibility has been very costly to create among central banks around the world, and I think it's a terrible mistake to take it for granted. Credibility is potentially very fragile; indeed, one of the central things that we need to pay attention to is how to maintain credibility. And the way in which you maintain credibility is a very important part of a rules-based monetary policy. An important part of maintaining credibility is to say what you are going to do and then do it. The central bank does what it said it would do unless it has a very good explanation for why it departs from what it said it was going to do.

Of course, we've had important institutional developments here with central bank independence, and, really, I think we've strengthened independence in the Federal Reserve although the law hasn't changed very much—strengthened independence in a practical sense. And that's been very important. But we should always keep in mind that the central bank is a political institution established by law or by treaty—by laws that can be changed. But even more than that: John Taylor's served in the government, I've served at the Council of Economic Advisers (CEA); any of you who've been there—Murray Weidenbaum, who recruited me to the CEA—anybody who's worked in the government knows that there are all sorts of things that are done around the edges of the law, behind the scenes, that are not exactly in line with what the law might call for. And there's a natural view, which I think is correct, to be suspicious because central banks in the past have not always been immune from behavior that is secret or around the edges of the law. So, to maintain the confidence that people need to have in the central bank, you need to do things with a great deal of careful planning and you have to maintain a very high level of integrity; you have to have people there who can be trusted not to be a part of the political process.

That problem is not going to go away. We live in a vigorously democratic society where people try to use government for various purposes that are not always in the national interest. And central banks are inevitably going to remain part of the political system, as they should. But we need to maintain the highest possible integrity in order to maintain confidence. And that's what I think bothers me about the Svensson and Williams paper: It misses a critical component. To me, one of the ways in which you could lose confidence is if you started to run experiments. I can't imagine having to write a press statement or to give a speech to explain why it was that we conducted an experiment that had predictable (and I mean *predictable*) consequences of a recession or mild recession to the purpose of learning more about some parameter. It's hard to imagine anything that we might do that would be more damaging to long-run credibility.

I'll describe one of the things that happened to me when I came to St. Louis, talking a little bit about my journey here, having been an academic for most of my professional career. When the St. Louis Fed's board of directors recruited me, John McDonnell was the chairman of the board; he said, "Bill you have to understand, you are not going to be able to do any research in this job." Well, it hasn't turned out that way. And, in fact, I think that with my research productivity jointly with the economists here (they've done all the hard work), I've accomplished more in these 10 years than I had in the previous 20.

The research started as a consequence, really, of dealing with issues that I needed to understand as a part of doing my job. But I didn't know where I could turn in the journal literature with which I was familiar to get any help with any of these issues. One of the very first issues was this question: If I am going to give a speech, what am I going to write, what am I going to talk about? And then how to deal with press contacts and the Q&A with press coverage and so forth.

So I started to think abstractly about the whole process of central bank communication, and I went back to what I would regard as the two first principles that come out of the rational expectations literature. One is that the private sector needs to know what the central bank is doing. And you can't have a good equilibrium if the private sector doesn't know what the central bank is doing. A part of that requires that the central bank itself knows what it is doing. That's the place to start. So, anyone who has been in a classroom, and most of you here probably have, know that you hone your own ideas and develop a great deal of clarity when you are forced to actually stand up and talk about them. And part of the effort to understand on a more systematic basis what sort of policy adjustments we should make comes from pinning down the fundamental nature of the policy rule. And John, particularly, of course, has led the way on that.

So that's part of the process, and the private sector learns about what the central bank is doing in good part just from observing what it is doing and trying to put some system into that, which you in principle can extract from what's done without any words on our part. But there are certainly lots of cases where this signal extraction might go a lot more smoothly and a lot more quickly if the central bankers would actually talk intelligently about what they are doing. Think about the context of a simple learning model, for example. Suppose that the central bank has been operating on some value of a parameter and then decides for whatever reason that it wants to have a different value of that parameter. Well, it might take someone with Jim Hamilton's skills to generate an enormous number of observations to actually discover from central bank behavior that the parameter has changed. And in the meantime, that means that the private sector is operating under a different understanding of that parameter than the central bank is operating under. That produces expectational problems in terms of the equilibrium and efficiency. If we could explain what we are doing, why this parameter has changed, we ought to be able to move that equilibrium to the correct point much more quickly. So that's part of the task of central bank talk: Explain what we're doing and why were doing it, to help promote a good equilibrium between the central bank and the private sector—an equilibrium in which the meshing of knowledge is really critical to the efficiency of the outcome.

But it seems to me that there is a second principle that's extremely important from the rational expectations literature: The central bank ought not to be purveyors of random disturbance. We ought not to add random noise to the system either in terms of the actions we take or in terms of what we say.

So you're standing up in front of an audience and you've got these two things you're struggling with: first, trying to convey genuine information, and second, trying not to say something that causes a market disturbance that is decidedly not helpful. Some of the press people might love it, but it's not what I ought to be doing. Now, when I came, I had no professional guidance in any of the economics literature about how to do this. I knew what the basic principles were. But what do you actually do when you are standing up in front of an audience? I had no guidance whatsoever. Probably I didn't read enough memoirs; I don't know. But I don't think that people generally talk about this kind of thing in their memoirs, either.

So, I started to think a lot about the communications process, and I know that one approach that some people take is that, they're so worried about the second problem, they give up on the first and so they really don't say much of anything. That didn't seem to me to be satisfactory, because I thought the first principle of trying to produce a better understanding in the marketplace of what the central bank is doing was really an important responsibility of my office.

Another issue is that behavior of the markets is obviously driven by active and by-and-large pretty well-informed market participants, not primarily by Main Street. And a lot of what we do out here in the Reserve Banks is to wander around the Districts or, more broadly speaking, to audiences of all sorts, with different backgrounds and degrees of expertise. One of the communications challenges is to be able to give a speech that says something to well-informed people and at the same time doesn't pass completely over the heads of people who are not so well informed. Of course, that puts a lot of constraints on what you say, but also *how* you say it.

But why would we care about Main Street? Well, one of the very important reasons is that this is the business we're in. The monetary policy business that we're in is designed to improve the welfare, and maintain a high degree of welfare, for all the citizens. For Main Street as well as Wall Street. We need to talk to bankers and traders and portfolio managers, but we also need to talk to Main Street because these are our constituents. At any moment in time, all the time, the interests of various people in the markets are in conflict: Some people are long, some people are short, some people have short-term investments, some long-term investments, some equity, some bonds, and so forth. There are a lot of different interests, and it is extremely important that we serve the "general interest." I think that what that means is that we have broad macroeconomic objectives that we can summarize quite well in talking about the dual mandate: maintaining the stable purchasing power of the currency and reducing fluctuations in GDP and employment from equilibrium paths. If we are successful with these explanations, we will have done 99.9 percent of what we can do and what we ought to do.

Another important reason for talking to Main Street can be illustrated by a story from when I was at the CEA. That was a difficult period, in the early 1980s, and there was a lot of commentary on the part of Congress and to some extent the administration about Federal Reserve policy. Knowing a lot about the Fed, I was trying to explain to people that pushing the Fed was counterproductive from the point of view of the interests of the politicians themselves. I remember that a senator, who often made comments about the Fed, wanted lower interest rates. (By the way, you may have seen the comment that Alan Greenspan made, in one of his interviews, that not once while he was in office did he ever get a phone call or a letter from a politician recommending higher interest rates. Not once. There is an asymmetry here.) So, a lot of the politicians are not all that well informed about monetary policy, and I remember going up to Capitol Hill and talking to a very prominent senator and saying, "You have to understand that the Fed values its independence and it is extremely important that the Fed not appear to be responding to the entreaties of politicians. And, therefore, if you

want interest rates lower, you will not get the result that you want by blasting the Fed, because the Fed can't respond to that blast. It's not in your interest." He said, "I understand that, but it plays well on Main Street." It was very simple. Very simple. So, one of the reasons to talk to Main Street is to help people understand why that position is wrong. I hope that people will develop a tin ear to language like that that comes from all sorts of different directions.

Another issue that I've been quite concerned about during my time in St. Louis has been trade issues. I have made a good number of speeches where I've talked about trade and capital flows, the importance of world markets, and trying to resist—I don't even like to use the word "protectionism," because it is good to try to protect people—the kind of economic *isolationism* that many of these policies encourage. So, we need to talk to Main Street as well as the monetary experts, and that makes the communications issues both challenging and very, very interesting. Very interesting.

I do want to say one other thing. John referred to a lecture that I gave earlier this year. He did not mention that this was an event on Milton Friedman's birthday. It was out at the University of Missouri, and a point that I remember vividly from those days in Chicago, and a point that I think has tremendous importance today, is that Milton always argued—and Brunner and Meltzer, and others, but Milton sort of led this analysis—that one of the great advantages of a monetary aggregates rule is that it allows maximum scope for the market to respond to disturbances and move interest rates in a way that will be stabilizing. Built-in stability is very important. Of course, there is a huge literature about the built-in stabilizers in the fiscal policy area. The current policy stance has the advantages of high credibility, well-anchored inflation expectations, and the possibility of understanding in a more formal way with several decoupled interest rates in the model of allowing the market to do a great deal of the stabilization work. That has enormous advantages in producing efficient results. It allows the Federal Reserve at many critical times to sit back and watch until the situation is clearer in terms of the arriving evidence. And you can go through lots of recent cases where there have been very substantial fluctuations in long-term interest rates that do an enormous amount of the stabilization work for us. That provides great clarity in the stance of policy and at the same time is a framework that produces a tremendous amount of built-in stabilization.

REFERENCES

Poole, William. "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model." *Quarterly Journal of Economics*, May 1970, *84*(2), pp. 197-216.

Poole, William. "Rules-of-Thumb for Guiding Monetary Policy," in *Open Market Policies and Operating Procedures: Staff Studies*. Washington, DC: Board of Governors of the Federal Reserve System, 1971, pp. 135-89.